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(71) Applicant (for all designated States except US): **THE REGENTS OF THE UNIVERSITY OF CALIFORNIA** [US/US]; 1111 Franklin Street, 12th Floor, Oakland, CA 94607 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **FUJII, Tetsuo** [JP/US]; 7240 Davenport Road, #104, Goleta, CA 93117 (US). **GAO, Yan** [CN/US]; 705 Bolton Walk, #102, Goleta, CA 93117 (US). **HU, Evelyn, L.** [US/US]; 1160 North Fairview Avenue, Goleta, CA 93117 (US). **NAKA-MURA, Shuji** [JP/US]; P.O. Box 61656, Santa Barbara, CA 93160 (US).

(74) Agent: **GATES, George, H.**; Gates & Cooper LLP, 6701 Center Drive West, Suite 1050, Los Angeles, CA 90045 (US).

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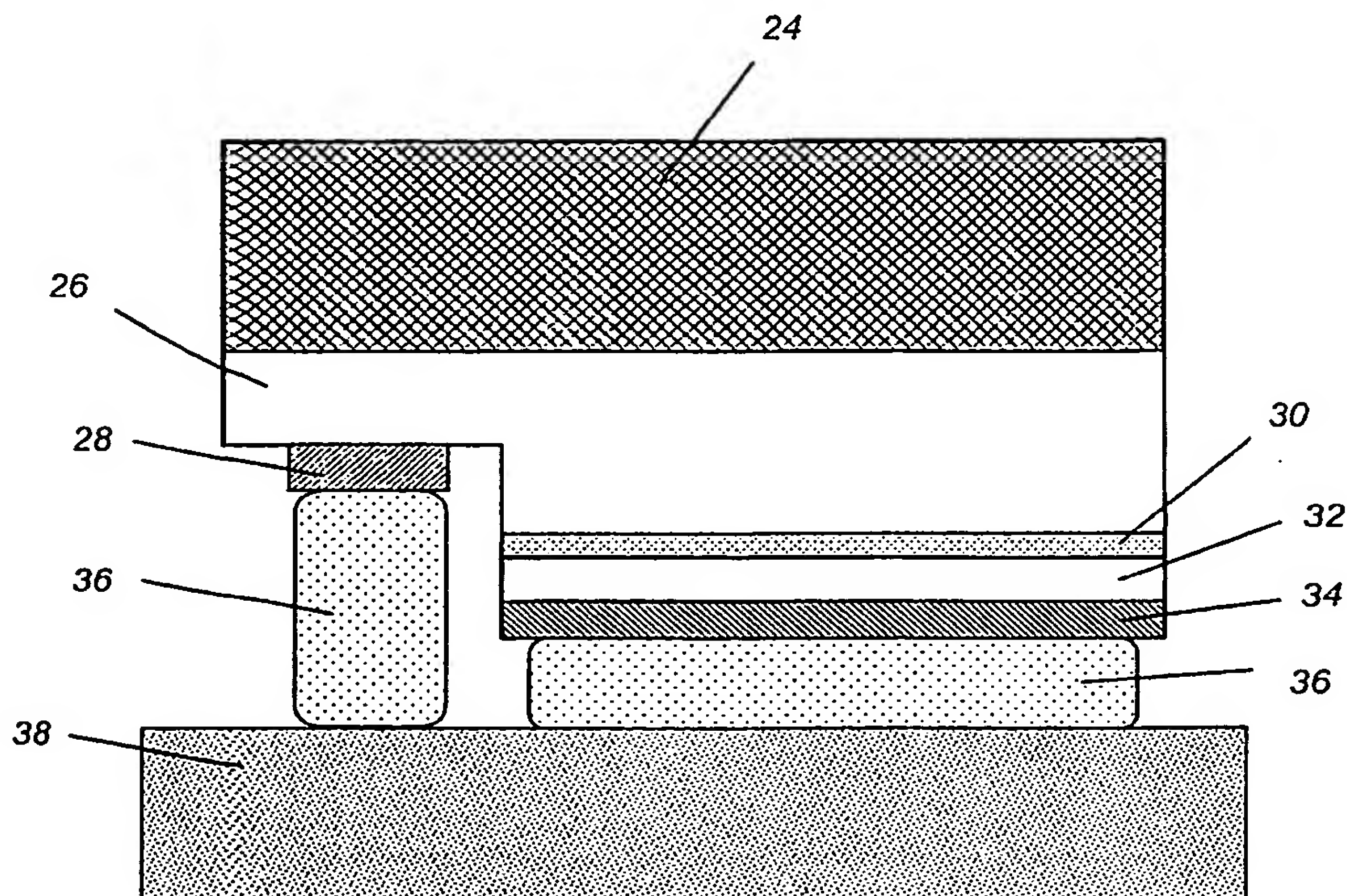
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(54) Title: **HIGHLY EFFICIENT GALLIUM NITRIDE BASED LIGHT EMITTING DIODES VIA SURFACE ROUGHENING**



(57) Abstract: A gallium nitride (GaN) based light emitting diode (LED), wherein light is extracted through a nitrogen face (N-face) (42) of the LED and a surface of the N-face (42) is roughened into one or more hexagonal shaped cones. The roughened surface reduces light reflections occurring repeatedly inside the LED, and thus extracts more light out of the LED. The surface of the N-face (42) is roughened by an anisotropic etching, which may comprise a dry etching or a photo-enhanced chemical (PEC) etching.

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— with amended claims

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